SUPPLEMENTARY INVESTIGATION AT TICK ISLAND.

By Clarence Bloomfield Moore.

In the February, 1892, number of the American Naturalist, I gave an account of certain investigations made by me at Tick Island, Volusia Co., Florida. The readers of that article will recall that into the great sand mound at that place numerous trenches and shafts were made, resulting in the discovery of a number of objects of interest archæologically, and the formation by me of a theory as to the construction of the mound. This theory has not in any way been modified by a supplementary investigation continued with a party of seven assistants through January 15th, 16th, 18th, 19th, 1892.

The mound is built upon a circular heap of shell converging to an apex at the center. This heap was probably brought from neighboring shell deposits or a low heap already formed was used for the purpose. I am inclined to believe, however, that the shell was brought with a view to the formation of a solid base in the swamp, since irregular ridges and elevations of shell do not extend beyond the margin of the mound as is so often the case where sand mounds have been piled upon previously existing shell heaps. It will be remembered that a ridge of pure white sand with sloping ends ran north and south almost through the mound, this ridge being covered with brown sand having at times a certain admixture of shell, and that this covering of brown sand, comparatively small at the extremities of the ridge, attained great thickness on its sides to the east and west thus completing the conical shape of the mound.

On the western side of the mound, beginning at the margin of the base, was made a diverging trench, 8 ft. in breadth at the start, 54 ft. in length, or 4 ft. beyond the center of the mound. At 44 ft. from the starting point the breadth of the trench was 14 ft. and its depth 10 ft. From this point to the end the breadth of 14 ft. was maintained to a depth of 6 ft.

and two inches through the brown sand and converging to a width of 10 ft. through the white sand. No effort was made to penetrate the compact mass of shell at the base of the mound save at one or two points, where the usual debris of the shell heaps was found. The trench, when digging was discontinued (having followed the upward slope of the shell base) was 11 ft. and 10 in. in depth, of which the white sand above the shell was 5 ft. 8 in. and the upper layer or brown sand 6 ft. and 2 in., leaving to the shell base a thickness of 5 ft. and 5 in. above the level of the margin of the base of the mound.

At a distance of 30 ft. from the start the side of the white sand ridge was encountered, the trench up to that point running through the brown sand layer. The first skeleton was met with 24 ft. from the beginning of the trench. Previous to this many bones entirely disconnected, and mainly the larger bones of the skeleton, were found. With the exception of the articular portions the bones were not affected by decay to a marked extent as were those subsequently found covered by the white sand. It is possible that they are of a later period or that the lime salts from the admixture of shell have contributed to their preservation. As before stated these bones were not in association with each other but must not be confounded with the form of burial practiced on the east and west coasts of Florida and in at least one mound on the St. John's, namely Ginn's Grove, south of Lake Monroe, where piles of larger bones previously exposed were found buried horizontally surmounted by the skulls. Neither were the bones in any way crushed, split or charred, suggestive of the methods of many of the shell heaps of the St. John's River, nor did they show any signs of the breakage of necessity occurring when decayed bones are disturbed by the aid of implements. In the plateau constituting the summit of the mound were flexed burials (probably intrusive) in anatomical order and others were numerous on the slope bordering the plateau. Unless the disconnected bones were washed down when the mound was larger and not as at present held compactly together by the roots of vegetation, I can form no hypothesis to offer as to their condition when found.

In the white sand ridge as before, lying upon the shell base, were found burials in anatomical order, while differing from our former investigation some interments were met with in the white sand considerably above the shell.

Owing to decay and to the pressure of sand no crania were saved though great pains were taken and preservative agents were at hand. In this connection I may say that from seventeen burial mounds on or near the St. John's River more or less thoroughly explored by me, I have taken but one whole skull in good condition. So great is the pressure exerted by heavy masses of sand that often the shafts of tibiæ found at the base of burial mounds have been crushed. Such being the case it can readily be conceived how slender are the chances to recover a skull in perfect condition.

As before no mark of decay was found in any of the teeth though many showed signs of excessive wear. Many of the bones gave evidence of having served in frames endowed with great muscular strength, the ridges being very noticeable.

In the femurs the linea aspera was prominent, some with a tendency towards the "pilaster." But two femurs of the many found possessed the articular portions sufficiently intact to allow measurement as to length.

Of the two of which measurements were taken the length of one was 18 in. (tape) to the tip of the great trochanter and that of the other $16\frac{1}{2}$ in. (tape) to the upper margin of the head. Taking .275 as the ratio of the length of the femur to the entire stature it will be seen that no great height is indicated. Of course no general rule can be drawn from two cases but a large number of femurs exhumed from the Tick Island mound with articular portions more or less decayed were at least in sufficiently good condition to allow a fairly close estimate and of these and of hundreds of others met with in burial mounds and shell heaps in Florida I can say that none indicated a stature of six feet. Four tibiæ exhumed intact measured respectively $14\frac{1}{2}$ in., $12\frac{2}{3}$ in., 12 5-6 in., and $14\frac{1}{2}$ in. in length (tape).

Platycnemism.

It will be remembered that in recent years a marked lateral flattening of the tibiæ has been noticed as a characteristic of early and savage races in various parts of the world. This flattening exists in a varying degree and is frequently found in connection with anterior curvature. Measurements are usually made where the nutrient artery enters the bone and the percentage of the lateral diameter as compared with the antero-posterior diameter, ascertained.

According to Topinard (Anthropology p. 299 et seq.) the peculiarity was first commented upon in relation to the family buried at Cro-Magnon. He furthermore states that in two hundred Parisian tibiæ dating from the fourth to the tenth centuries 5.25% were platycnemic while 14% were bent. Unfortunately the degree of flattening is not given.

Prof. Wyman (Fresh Water Shell Mounds of the St. John's River, Florida, page 67) says "the proportion of the transverse to the fore and aft diameter in whites as compared with Indians, comprising mound builders, is as follows: The fore and aft diameter being taken as 1.00 the transverse in twelve whites 0.70, in twelve from the mounds of Florida 0.64, in seven from mounds in Kentucky 0.63, in two from Osceola mound (a shell heap now known as Crow's Bluff) 0.59, three from the mound on the St. Clair River 0.60, five from the mound on River Rouge 0.53, in an Aleutian islander 0.56, in an Eskimo 0.60, in a Californian 0.53, in a tibia from the Merrimac River 0.60, in a Peruvian 0.50, in a Gorilla (male) 0.57, Gorilla, (female) 0.71, Chimpanzee 0.65." It must be borne in mind that Prof. Wyman's researches into the burial mounds of Forida were very superficial (see foot-note Fresh Water Shell Mounds, page 47) and his measurements probably relate to tibiæ of intrusive burials, though between the tibiæ of later Indians and those from original interments in various sand mounds of the St. John's the difference in flattening is not marked.

Another point carefully to be borne in mind is that the measurement of a single tibia amounts to little in the estab-

lishment of a race characteristic. Between the maximum and minimum degree of flattening among the tibiæ found at Tick Island was a difference of 31%.

Prof. Edward S. Morse (Shell Mounds of Omori) gives the percentage of nine recent Japanese tibiæ as 0.74, one tibia from the shell heaps of Omori 0.62, one from a shell heap in the province of Higo 0.5002.

In Michigan platycnemism has been noticed to a marked degree. Mr. Henry Gillman (Smithsonian Report for 1873 page 368) cites nine tibiæ from a number found by him in the great mound on the Rouge River and in the circular mound on the Detroit River. Of these the average was 0.486, the lowest being 0.402.

It is to be regretted that the average of the entire number found is not given.

Of the very many tibiæ exhumed at Tick Island fifty-five were in condition for measurement, many being broken at a point too low for determination, while others were crushed. It is of course apparent that all tibiæ must be discarded where a lateral flattening exists through causes acting on the bone after interment, since measurements made without due care in this respect would give and unfairly, a very low percentage to the lateral diameter.

All measurements are made with calipers in hundredths of an inch. Of the fifty-five tibiæ the least platycnemic measured transversely .96 inch and antero-posteriorly 1.16 inch, a percentage of 82, while the two lowest (now in my possession) were respectively .72x1.41 and .75x1.45 or 51% and 51.7%, the average for the fifty-five tibiæ being 63.9%.

In this connection it is possible that statistics as to tibiæ found by me in other mounds of the St. John's may be useful for purposes of comparison.

	Per cent.
Burial mound at Ginn's Grove near Lake Jessup; three tibiæ, intrusive burials, average	64.77
Thirty-three tibiæ, original burials from base of mound average	64.9

Persimmon mound, about twenty miles south of Lake Harney; burials in shell heap, 4 tibiæ 58.3
Orange mound, near Persimmon mound; original burials in shell, three tibiæ . . . . . 58.
Raulersons, south-eastern end of Lake Harney; burials (?) nine tibiæ 62.5
Small burial mound, Stark's Grove, Lake Beresford; one tibia . . . . . 84.
Shell heap, near Econlockhatchee Creek; burials (?) three tibiæ 59.9
Burial mound on Blue Creek, near Volusia; one tibia 64.8
Burial mound, Thornhill Lake, near Lake Jessup; two tibiæ, three feet from surface 60.4
Three tibiæ, original burials . . . . . 65.
Burial mound opposite Huntoon Island; original burials, five tibiæ . . . . . 62.
Intrusive burials, five tibiæ . . . . . 64.
Burial mound, Fort Taylor, Lake Winder; original burials, four tibiæ 64.8
Mulberry mound, near Lake Poinsett; original burials, sixty-six tibiæ 66.2
Bluffton, sand mound; intrusive burials, three tibiæ 70.7

Perforation of the Humerus.

The perforation of the wall between the fossæ at the lower end of the humerus seems to be a characteristic of early and unmixed races. The perforation does not necessarily occur in both humeri of the same person. Mr. Henry Gillman (American Naturalist, 1875, page 427) noticed it in the mounds on the Detroit and Rouge Rivers, Michigan, but unfortunately bases the percentage of its occurrence on an estimate.

Topinard (Anthropology page 298 et seq.) furnishes an interesting table as to the frequency of the occurrence of the perforation of the humerus at various periods in France.

Number of humeri.		Per cent.
66	Caverne de l'Homme Mort (La Lozere) . . .	10.6
368	Dolmens of La Lozere	10.6
128	Stations of Vaureal, Orrouy and Chamans . .	21.7

(Polished stone period.)

44	Pre-gallic station of Campans	12.5
42	Mountaineers of the Ain (5th Century)	27.7
69	French Basques	13.4
200	Parisians of the 4th to the 10th century . . .	5.5
218	Parisians of the middle ages	4.1
150	Parisians anterior to the 17th century	4.6
1000	(?) Merovingians of Chelles	2.0

It is well to remember in examining the olecranon fossa that the partition, if it exists, is often extremely thin and when sand or earth is removed with a pointed instrument an artificial perforation may result. In the humeri examined by me at Tick Island and other burial mounds, data as to which are furnished for comparison, all foreign substances were removed from the cavity with the aid of a soft brush. It is therefore believed that none but pre-existing perforations are enumerated.

			Per cent.
46	Humeri, Tick Island,	16 Perforated . . .	34.8
42	Humeri, Ginn's Grove,	9 Perforated . . .	27
7	Humeri, Persimmon mound,	4 Perforated . . .	57
4	Humeri, Orange mound,	0 Perforated . . .	
19	Humeri, Raulerson's	8 Perforated . . .	42
2	Humeri, Lake Beresford	0 Perforated . . .	
3	Humeri, Econlockhatchee Creek	1 Perforated . . .	33.33
9	Humeri, Thornhill Lake	6 Perforated . . .	66.66
14	Humeri, opposite Huntoon Island	7 Perforated . . .	50
4	Humeri, Fort Taylor	1 Perforated . . .	25
76	Humeri, Mulberry mound	40 Perforated . . .	52.7
3	Humeri, Bluffton	3 Perforated . . .	100.
229		95	41.5

Pathological Specimens.

In the former excavations a number of tibiæ were found with marked anterior curvature and increase in the circumference of the bone with roughened surface. But one of this nature was met with upon the last visit to Tick Island, at five and a half feet from the surface and twenty-five feet from the margin of the base of the mound.

Perforated Crania.

One cranium with perforation at parietal eminence .7 in. antero-posteriorly and .6 in. transversely was the only skull found showing perforation and in this case the uneven margin showed it to be the result of a blow from a pointed instrument, having nothing in common with the round and even perforations found in fragments of two crania during previous investigations.

Pottery.

Throughout the entire upper stratum were found fragments of pottery, the large majority undecorated but some ornamented with parallel lines.

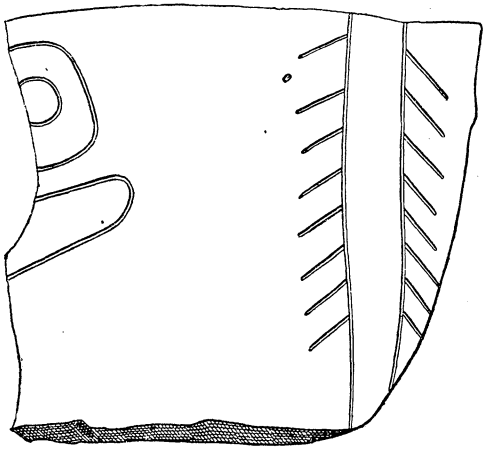

Fig. 1.

In the white sand layer were found bits of pottery in immediate association with every skeleton, many plain, some rudely ornamented in the same manner as those found in the stratum above.

One piece found near the bottom of the white sand layer bore a pattern not met with by me in any other sand mound or in several hundred excavations in shell heaps on or near the St. John's. (Fig. 1.)

At forty-two feet from the circumference of the base and ten feet from the surface of the mound, at the bottom of the white sand layer, with the crumbling bones of a skeleton was found in perfect condition a small earthenware pot with sides deeply grooved, of a pattern entirely unfamiliar to me. (Fig. 2.)

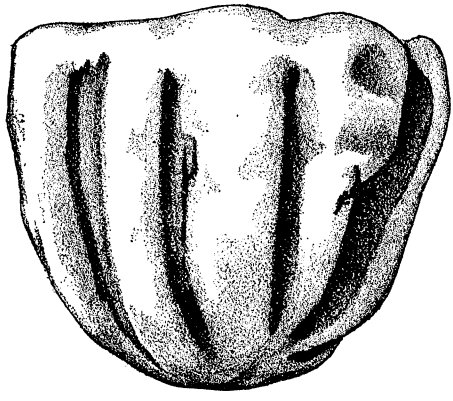

FIG. 2.

Pottery decorated with knobs, of which several specimens were found last year, was not met with during these supplementary investigations at Tick Island nor have I seen them on or below the surface in mound or shell heap on the St. John's River between Palatka and Lake Washington, a distance by water of about three hundred (300) miles. This knobbed pottery was sent to the Peabody Museum of Archæology and a report from the very high authority there could not fail to be of interest.

Fragments of Pottery Shaped in the Form of Spear and Arrow Points.

Reference was made to this subject in my former paper.

During the supplementary investigations many bits of pottery broken in triangular shapes, were found particularly with the burials in the lower sand layers. At least two fragments of pottery were found giving unmistakable evidence of the arrow-head shape having been conferred through design, the sides being chipped rudely to imitate the point of the arrow. Since the writing of my first paper I have secured so much evidence tending to show that the Indians of the earlier burial mounds substituted with their burials the imitation for the real in the way of arrow-heads and spear points that I regard the question as virtually settled.

In the mound at Ginn's Grove, south of Lake Monroe, the custom was very apparent; the great sand mound on Lake Winder emphasized the fact, while in the small burial mound discovered by me near Lake Poinsett nearly every piece of pottery was broken or chipped in the form I have described.

Implements, Ornaments, Etc.

About three feet below the surface, not in association with any skeleton, a very beautiful polished celt 8½ in. in length was brought to light. This implement cannot however be regarded as belonging to the period of the construction of the mound.

Other objects of interest were:—a piece of coquina rudely fashioned in the form of a spear head; two flakes of flint; portion of "conch" shell; two pieces of madrepore; shell implements of doubtful attribution; handful of shell beads with skeleton of child five feet below the apex of the mound. With the beads were a fragment of calcined bone and a flake of flint. Two feet distant was the claw of a large animal, probably a bear. On the shell base not far from the center of the mound were found a number of pieces of what Professor Putnam pronounces to be soft coal and furthermore states that

any previous discovery of this commodity in Florida is unknown to him.

Possible Indications of Cannibalism.

At the bottom of the white sand ridge, nine feet four inches from surface and thirty-five feet from circumference of the base of the mound, was found a skeleton very badly decayed. Immediately below were apparently the remnants of a feast consisting of a fragment of charred bone and four pieces of bone showing no action of fire, of which two were human. These fragments entirely unassociated with any others were in a better state of preservation than the skeleton immediately above owing to the shell below them. In every way they resembled the bones of the shell heaps.

From one fragment, a portion of the lower jaw of a child, every tooth was missing. While no definite conclusion can be arrived at in this connection it may be permissible to suggest that the process of boiling would be conducive to the loosening of the teeth. No other isolated human bones were found in the white sand layer.

An Intrusive Burial.

As before stated intrusive burials were frequent in the Tick Island Mound. A description of one of these may be of interest. It will be rememberd that flexed burials vary greatly in the mounds of the St. John's as to the degree and form of flexion.

Near the apex of the mound, eighteen inches from the surface, lay a skeleton in a fairly good state of preservation, though the skull was crushed beyond recovery. The body lay belly down, the face rotated to the right with the neck flexed in that direction. The left lower extremity had the thigh flexed to the abdomen, the leg flexed on the thigh with the foot extending downward. The right lower extremity had the thigh abducted and rotated externally to the transverse plane of the body and flexed to a right angle, the leg flexed on the thigh and the foot extended. The arms were somewhat

disturbed by digging but enough was seen to show that they were not folded on the abdomen as is often the case. The skeleton was of a man, the length of one femur was 16½ in. One humerus was perforated, of the other the portion necessary for determination was decayed. One tibia was 14½ in. in length. The lateral diameter was .82 in., the fore and aft measurement at the same point 1.44 in. giving a percentage of 57.

Comparative Age of the Mound.

As was the case during previous investigations no object indicating intercourse with the whites was found. Taking into consideration the quantity and quality of the pottery it is probable that the Tick Island Mound is of more recent construction than certain other burial mounds on the St. John's in which no pottery is met with, for judging from its almost universal association with skeletons in so many mounds we must consider it probable that no cause save ignorance of the art of its manufacture can explain its absence in other burial mounds.

In a careful investigation of the shell heaps of the St. John's made by me, extending to Lake Washington, during which several hundred excavations were made in upwards of sixty localities, nothing in anyway indicating the presence of the whites was ever brought to light. It will be remembered that Prof. Wyman's investigations had the same result. There are then strong reasons to believe that the last shell heap was completed prior to the arrival of Europeans.

In a large shell heap of the upper St. John's I was fortunate enough to discover under several feet of shell a stratified burial mound, particulars of which I hope to publish later. From this discovery and from the fact that presence or absence of pottery in the mounds as a rule coincides with neighboring shell deposits I am inclined to believe that the larger burial mounds including Tick Island are contemporary with the later shell heaps at least and were abandoned prior to the coming of the whites.